

## **207 TRENCH EXCAVATION AND BACKFILL**

### **207.01 DESCRIPTION**

Work consists of excavation, shoring, supporting utilities and backfilling as required in open trenches to specified widths and depths for the construction of sewers and watermain and their connections. It shall also include disposal of unsuitable and excess materials.

### **207.02 TRENCH SHORING**

The Contractor shall furnish, place, maintain, and remove such sheeting, bracing and other supporting material required to properly support trench side walls and side walls of cuts, and to prevent the movement which might in any way injure persons, the project, or other structures near the project, or reduce trench dimensions below those needed for proper construction.

When excavation depth exceeds five (5) feet, adequate shoring is required. For deep trench cuts, adequate trench shields, braced or unbraced sheeting may be necessary.

Working drawings for the proposed method for trench support, maintenance, and shoring removal shall be prepared under the direction, and bear the seal, of a Registered Professional Engineer with a valid P.E. license. Working drawing submittals will be for information only, and shall be submitted in advance of work. The Engineer shall be notified in advance of any change in method of trench support and maintenance.

If the Contractor elects to use sheeting, the sheeting shall be removed in conjunction with trench backfilling. However, if approved in writing, sheeting may be cut off and left in place below a line one foot above the top of the pipe.

Voids that may develop outside the sheeting, shoring and bracing shall be promptly filled with appropriate material such as gravel, sand or other approved material. If at any point sufficient or proper supports have not been provided, the Engineer may order additional supports to be installed at no cost to the District.

### **207.03 TRENCH EXCAVATION**

Trench excavation shall include removal of all materials and objects of whatever nature encountered in excavation, excluding rock and existing steel sheeting left in place.

Sewer and watermain trench operations shall be coordinated with other utility work and scheduled to meet maintenance of traffic provisions.

Trench width for payment at all sewer and watermain trench cross sections will be based on requirements of 207.05(A).

Surface materials of whatever nature shall be removed within trench limits.

Cuts through existing hard surface roadways shall be made by saw cutting to a depth of approximately one inch along the trench limit line and then using pneumatic tools as required to make even, neat edges. The types of paving materials to be cut are indicated in the contract documents but not guaranteed.

Use of impact type breakers for PCC and AC removal over trenches shall be restricted to the Hoe

Ram type or approved equivalent. This equipment may be restricted or prohibited when in the public interest.

Operations shall be conducted so as to avoid injury to tree trunks, branches, and roots. Excavations within limits of tree limb spread shall proceed with care either by use of hand tools or with equipment that will not cause tree damage. Exposed roots 2 inches and larger in diameter shall be wrapped in burlap or other approved material and kept moist at all times. Roots 2 inches and larger in diameter outside the actual space occupied by the sewer or structure shall not be cut; excavation shall be tunneled under these roots. When approved, tree branches that interfere with construction may be trimmed in advance of excavation. Root cutting and branch trimming shall be performed in accordance with accepted horticultural practice.

When excavating trench through lawn, park or other tillable areas, sod and topsoil shall be removed with care as directed and salvaged if suitable for reuse in restoring disturbed surfaces.

When approaching existing underground construction which may be in proximity to sewer grades, or approaching existing sewers or watermain for connections, the trench shall be opened a sufficient distance ahead of the work, test pits made per 212, or other approved exploratory methods employed to allow for authorized changes in line and grade. Changes in line and grade plus excavation and pipe removal caused by failure to take such precautions shall be made at the Contractor's expense.

The Contractor shall support all exposed underground pipes or conduits along their entire exposed length using timber or steel in such a manner that backfilling may be performed without dislodging such pipes or conduits. No additional payment will be made for support material left in place nor for installing and maintaining supports.

At the Contractor's option, actual width of trench above the top of the pipe may exceed the permissible width below the top of the pipe if approved by the Engineer. No additional payment will be allowed for the additional excavation and backfill.

Utility service connections and appurtenances to individual premises may not be shown in the contract documents and the Contractor shall determine the exact location of, and maintain, these services.

With prior approval, portions of trench excavation may be removed as tunnel at the contract price for Trench Excavation measured from surface as if open cut. Tunnel bracing and all repair shall be included as part of work.

Tunnel excavation shall meet requirements of Safety Standards, Rules and Regulations For Work In Tunnels And Work Under Compressed Air. In tunnel excavation, work includes backfilling the void between sewer structure and tunnel roof with PCC of approved mix design. If during tunnel work there is any sign of settlement or loose material in the tunnel roof or walls, the excavation shall be made in open trench as directed. Tunneling will not be permitted when outside of tunnel roof is within 2 feet of the bottom of PCC or AC base.

Tunnel bottom shall be excavated approximately flat and square with trench walls. When material at trench grade is suitable, trench bottom shall be protected and maintained. Extra excavation and disposal, furnishing and placing undercut gravel to maintain trench bottom shall be at Contractor's expense.

If material found at the bottom of the trench is unsuitable for a foundation for pipe bedding, it shall be removed by the Contractor as directed and replaced with gravel or crushed stone per 207.06(A). Payment will be per 207.06(B).

Except in downtown and other congested areas, trench excavation shall be completed at least 25 feet

in advance of pipelaying; at end of a work day or at the discontinuance of work, the pipe laying may be completed to within five (5) feet of the end of the open trench.

All suitable trench excavation material meeting requirements of 804.05 shall be stockpiled, protected, and maintained. Excavated materials shall be neither deposited nor stockpiled so as to endanger new or existing structures or utilities, nor to interfere with project construction sequence and work by others.

The Contractor shall remove and dispose of all excess and unsuitable materials, and shall furnish his own disposal areas.

**(A) ABANDONED UTILITIES.** Work includes removal of abandoned utilities or utilities to be abandoned within limits of trench excavation. Open ends of abandoned utilities or utilities to be abandoned shall be bulkheaded by either 9 inch thick brick masonry in large size openings, 9 inch thick brick masonry or PCC of approved mix design in small size openings, or 9 inch thick PCC of approved mix design or cast iron plugs or caps in small diameter abandoned watermains.

All abandoned in-place sewers with a 36-inch or larger diameter shall be filled with suitable material prior to bulkheading.

Watermains and water appurtenances shall be abandoned in place as directed. Frames and covers of manholes and valve casings to be abandoned shall be salvaged and returned to the District property yard. Abandoned manholes and water valve casings shall be backfilled to grade with approved trench fill. Abandoned fire hydrants including standpipe and boot shall be removed and delivered to the Bureau of Water Services Property Yard; hydrant lateral shall be plugged. Watermains to be salvaged shall be severed as directed with a smooth cut at a joint or at an intermediate point if approved.

Whenever manholes or water valve casings to be abandoned are isolated from trench excavation limits, they shall be abandoned in place as indicated above and payment made per 303 or 313 as applicable.

Breakage will not be permitted. Mains 24 inch diameter and larger must normally be cut. Any loss of value resulting from damage to usable and surplus watermain materials resulting from Contractor operations will be charged to the Contractor.

**(B) DEWATERING.** Trench dewatering and drainage, including pumping and well points, when needed, of all surface and ground water shall be included as part of trench excavation.

**(C) TEMPORARY PLATING OVER TRENCHES.** To maintain traffic and safety, steel protection plates per 624 shall be used as directed to temporarily bridge trench excavations. Plates shall be of a size and positioned to provide adequate bearing at plate edges, and shall be securely anchored. Plates shall be of sufficient thickness to safely carry heavy traffic without detrimental deflection. Plate edges exposed to traffic shall be feathered with asphalt mix.

Work includes surveillance and adjustment of plating over trenches which shall be provided by the Contractor during non-work hours, weekends and holidays.

Plating and asphalt around plates shall be removed when directed.

## **207.04 TRENCH BACKFILL**

When pipes and connections are complete and approved, trenches shall be backfilled per 203. Suitable excavated materials meeting requirements of 804.05 and density and moisture per 203.03(A) and (B) shall be used as directed for trench backfill. Base soils shall be used in that portion of the trench

projecting through soils base layers.

Each lift shall be compacted to density requirements herein before next lift is placed.

The minimum in place density of trench backfill shall be 93 percent for each layer up to 6 inches below subgrade and 95 percent for the top 6 inch layer below subgrade. In trenches outside of roadbed areas all layers shall be compacted to at least 93 percent of standard density. The use of "Hydra-Hammer" for compacting backfill in trenches is prohibited. Compaction by hand will be required where necessary.

Trench fill soils shall have a uniform moisture content suitable for compacting to specified density. If rutting, pumping, heaving, or shearing occurs under action of compaction equipment even though soil meets density requirements, affected material shall be replaced to limits as directed.

Trench fill material shall be dumped outside the trench excavation and not end-dumped directly into trench. Fill shall be placed in uniform horizontal layers of not more than 6 inches loose depth and for full trench width. Any fill placed on frozen trench soils shall be removed at Contractor's expense.

Backfilling shall proceed without displacement of the grade and alignment of the pipeline and settlement of backfill shall be considered evidence of improper workmanship or inclusion of unsuitable backfill materials, or both, and will require regrading and realigning the pipeline and removing and recompacting settled material at no District cost.

Puddling and jetting will not be permitted. All trench shoring and supports shall be so removed that trench cave-in and settlement are minimized and no voids remain. Voids caused and left by sheeting and shoring removal shall be backfilled with pervious fill or other approved material and compacted at Contractor's expense. All material displaced by slides, settlement, and trench cave-in shall be removed and replaced with specified soils at Contractor's expense.

The Engineer may require trench backfilling over completed pipe lines at any time if in his judgement such action is necessary. Extra compensation will not be allowed for such trench backfilling.

The Engineer reserves the right to limit the amount of pipe laid in advance of backfilling, but in no case shall these amounts exceed 100 feet for sewer work and 50 feet for watermain work.

## **207.05 MEASURE AND PAYMENT**

The unit of measure for Trench Excavation and Backfill will be the cubic yard. Space occupied by abandoned utilities will not be deducted. Volumes will be computed from following dimensions:

**(A) WIDTH.** The width for payment at all sewer trench cross sections will be based on outside diameter of the sewer pipe barrel plus the following on each side thereof:

- 12 inches for 10-24 inch diameter pipe
- 18 inches for 27-42 inch diameter pipe
- 24 inches for larger than 42 inch diameter pipe

The width at all watermain trench cross sections will be based on outside diameter of the watermain pipe barrel plus 18 inches.

Unless otherwise directed, if actual trench width below top of pipe exceeds pay width, the Contractor shall submit to the Engineer for approval, a pipe installation of adequate supporting strength for the actual trench width. Additional costs, if any, shall be the responsibility of the Contractor.

The actual trench width above top of pipe may exceed trench pay width at Contractor's expense and if approved.

**(B) DEPTH.** The depth at any cross section will be based on mean depth from surface where trench excavation started to outside bottom of the sewer cradle or waterpipe or structure at that section.

**(C) LENGTH.** The length will be based on the horizontal projection of the completed sewer or watermain without deduction for manholes, valves and fittings. Other types of sewer structures will be deducted from length measure.

Payment for Trench Excavation and Backfill will be made at contract unit price per cubic yard as determined in 207.05, which payment will include disposal of excavated materials, shoring and all labor, materials, tools, equipment and incidentals necessary to complete work specified. Payment will not be made for sheeting and shoring left in place at the Contractor's option.

When water service and/or building sewer connections are part of contract, payment for trench excavation and backfill for water service and/or building sewer connections will be made under 308 and/or 316.

## **207.06 TRENCH UNDERCUT EXCAVATION**

**(A) GENERAL.** When material at trench grade is unsuitable, trench bottom shall be undercut to depth and width as directed. Undercut volume shall be backfilled with gravel or crushed stone per 804.06, compacted with a vibratory compactor, protected and maintained. Work includes disposal of excavated material.

**(B) MEASURE AND PAYMENT.** The unit of measure for Trench Undercut Excavation will be the cubic yard, with volumes computed from approved undercut dimensions. Provisions of 202.07 apply.

The unit of measure for Gravel for Trench Undercut will be the cubic yard, with volumes computed from approved undercut dimensions.

Payment for Trench Undercut Excavation from 0-5 feet inclusive average depth below approved Trench Excavation limits will be made at 125 percent of contract unit price per cubic yard for Trench Excavation in accordance with 207.06. Payment for excavation exceeding 5 feet average depth will be negotiated.

Payment for Gravel for Trench Undercut shall be made at the contract unit price per cubic yard complete in place as measured above, which payment will include labor, materials, tools, equipment and incidentals necessary to complete the work as specified herein, including furnishing, hauling, and compaction.

## **207.07 BORROW TRENCH BACKFILL**

**(A) GENERAL.** Trench excavation soils meeting requirements of 804.05 shall be used as trench fill, and shall be protected and maintained; furnishing approved borrow soils to replace approved trench excavation soils that become unsuitable shall be at Contractor's expense.

When trench excavation soils fail to meet requirements and when the quantity of approved trench excavation soils is insufficient, approved borrow trench backfill per 804.05 shall be used and payment made under Borrow Trench Backfill.

**(B) MEASURE AND PAYMENT.** The unit of measure for Borrow Trench Backfill will be the

cubic yard. The number of cubic yards will be computed by the average end area method, however, the Engineer may substitute other methods to determine the exact quantity. Measurement for borrow fill for trench backfill shall be limited to the trench pay width although its use beyond these limits will be required to properly backfill the trench as excavated. The space occupied by the pipe and cradle will not be included in the measurement.

The actual number of cubic yards as determined above will be paid for at the contract unit price per cubic yard, which payment will include all labor, materials, tools, equipment and incidentals necessary to complete the work as specified herein including furnishing, hauling and compaction.